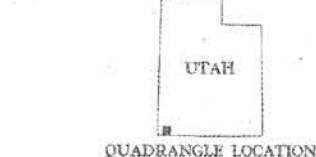
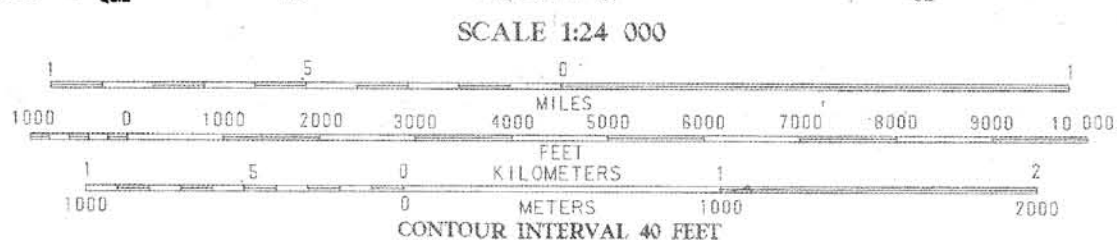


PRODUCED BY THE UNITED STATES GEOLOGICAL SURVEY
CONTROL BY USGS, NOS/NOAA
COMPILED FROM AERIAL PHOTOGRAPHS TAKEN 1978
FIELD CHECKED 1979
PROJECTION LAMBERT CONFORMAL CONIC
GRID INDIATOR UNIVERSAL TRANSVERSE MERCATOR ZONE 12
BROWNS POINT STATE GRID TICKS UTAH SOUTH ZONE
ARIZONA WEST ZONE
UTM GRID DECLINATION 13° WEST
1980 MAGNETIC NORTH DECLINATION 14° EAST
VERTICAL DATUM NATIONAL GEODETIC VERTICAL DATUM OF 1929
HORIZONTAL DATUM 1927 NORTH AMERICAN DATUM
To place on the predicted North American Datum of 1983,
move the projection lines as shown by dashed corner ticks
(6 meters north and 70 meters east).
There may be private inholdings within the boundaries of any
Federal and State Reservations shown on this map.
Where omitted, land lines have not been established.
All marginal data and lettering generated and positioned by
automated type placement procedures.

PROVISIONAL MAP
Produced from original
manuscript drawings. Infor-
mation shown as of date of
field check.

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225
OR RESTON, VIRGINIA 22092



1	2	3	4	5	6	7	8
1 Shinarump	2 Santa Clara	3 Washington	4 Jarvis Peak	5 St. George	6 Mesquite Spring	7 Plunging Canyon	8 Lizard Point

ADJOINING 7.5 QUADRANGLE NAMES

ROAD LEGEND
Improved Road
Unimproved Road
Trail
PLATE 1
Interim Geologic Map of the White Hills Quadrangle
Washington County, Utah
Open-File Report 352 September 1997
UTAH GEOLOGICAL SURVEY
a division of
Utah Department of Natural Resources
in cooperation with
U.S. Geological Survey

Description of Map Units

QUATERNARY-LATE TERTIARY

Alluvial Deposits

Qal_{1,2} **Alluvial-stream deposits** -- Moderately to well-sorted clay to small gravel deposits in large active drainages. Qal₁ includes benches up to 10 feet (3 m) above current channels; 0-10 feet (0-3 m) thick. Qal₂ includes deposits adjacent to and dissected by Qal₁, upper surface up to 30 feet (9 m) above active channels; 0-20 feet (0-6 m) thick.

Qat₁₋₆, QTat₁ **Stream-terrace deposits** -- Gravel to cobble size clasts in a muddy to coarse sand matrix; forms a poorly sorted, indurated pedogenic carbonate-cemented conglomerate at several levels above the present floodplain; clasts are well-rounded and many are exotic to the quadrangle, indicating a source several miles upstream; pedogenic carbonate (caliche) thicker in older deposits; subscripts denote relative heights above the current drainage and relative ages; level 2 deposits are 10-30 feet (3-9 m); level 3 deposits are 30-90 feet (9-27 m); level 4 deposits are 90-140 feet (27-42 m); level 5 deposits are 140-190 feet (42-57 m); level 6 deposits are 190-270 feet (57-82 m); and level 7 deposits are 270-350 feet (82-106 m) above present channels; typically 0-40 feet (12 m) thick.

Qao **Older alluvial deposits** -- Remnants of older, locally derived and moderately sorted clay- to gravel-sized alluvial deposits; are 10-30 feet (3-10 m) higher than, and dissected by, minor drainages. 0-10 feet (0-3 m) thick.

Qato **Older stream-terrace deposits** -- Gravel- to cobble-sized clasts in muddy to coarse sand matrix; forms isolated, indurated conglomerate; 20-50 feet (6-15 m) higher than, and not correlative to, current drainage; 0-20 feet (0-6 m) thick.

Colluvial Deposits

Qc **Colluvial deposits** -- Poorly sorted, angular- to rounded blocks in muddy to sandy matrix, deposited by sheet wash and slope-creep on moderate slopes; only larger deposits mapped; locally includes eolian, talus, debris flow and alluvial deposits too small to map separately. 0-20 feet (0-6 m) thick.

Mass Movement Deposits

Qmt **Talus deposits** -- Very poorly sorted, angular boulders with minor fine-grained interstitial sediment, deposited on and at the base of steep slopes; 0-10 feet (0-3 m) thick.

QTms **Old landslide deposits** -- Very poorly sorted, boulder- to clay-size debris in chaotic mounds; caps ridges and knolls that are over 400 feet (120 m) above drainages in northwest part of quadrangle; some boulders are in excess of 30 feet (9 m) across; blocks were derived primarily from Shinarump Conglomerate; 20-80 feet (6-24 m) thick.

Mixed-Environment Deposits

Qac **Alluvial and colluvial deposits** -- Poorly to moderately sorted clay- to boulder-size sediment in minor drainages; gradational with colluvial deposits; includes terrace outcrops too small to map separately; 0-10 feet (0-3 m) thick.

Qae, Qaeo **Alluvial and eolian deposits** -- Moderately to well-sorted, clay- to sand-size alluvial sediment that locally includes abundant eolian sand and minor gravel. Qaeo is dissected by current drainages; forms higher bench and has strong pedogenic carbonate (caliche), compared to Qae; mapped in broad, sloping areas north of the Santa Clara River; 0-30 feet (0-9 m) thick.

Qsg **Gypcrete and alluvial gravel** -- Pale-gray to pinkish-gray, punky gypcrete; basal part locally includes poorly to moderately stratified, moderately sorted, lenticular deposits of silt- to small boulder-size material; gypcrete forms a resistant ledge, present only on the highly gypsiferous Moenkopi Formation; 0-5 feet (0-1.5 m) thick.

Basalt Flows

Qbs **Santa Clara lava flow** -- Dark-brownish-black to black, subalkaline basalt flow, rocks have abundant small olivine phenocrysts in an alphanitic groundmass; very jagged surface; 10-30 feet (3-9 m) thick; estimated 10,000-20,000 years old.

unconformity

JURASSIC

Jmw **Whitmore Point Member of the Moenave Formation** -- Pale-red-purple to greenish-gray claystone interbedded with pale-brown to pale-red, thin-bedded siltstone with several 2-6 inch (0.05-0.15 m) thick beds of light-greenish-gray dolomitic limestone that contain algal structures and fossil fish scales of *Semionotus kanabensis* (Hamilton, 1984); nonresistant and poorly exposed; about 55 feet (17 m) thick.

Jmd **Dinosaur Canyon Member of the Moenave Formation** -- Interbedded moderate-red-brown siltstone and very fine-grained, thin-bedded, pale-reddish-brown to grayish-red sandstone with laminated cross-beds; forms ledgy slope; 250 feet (76 m) thick.

unconformity

TRIASSIC

TRcp **Petrified Forest Member of the Chinle Formation** -- Light-brownish-gray to grayish-red-purple bentonitic shale and siltstone with several lenticular interbeds of pale-yellowish-brown, cross-bedded sandstone up to 10 feet (3 m) thick; petrified wood is common; shales weather to a "popcorn" surface with abundant mudcracks due to bentonitic clay swelling and shrinking with moisture; forms well-developed strike valleys adjacent to the more resistant dip slope of the Shinarump Conglomerate Member; 700 feet (215 m) thick.

unconformity

TRcs **Shinarump Conglomerate Member of the Chinle Formation** -- Varies from a grayish-orange to moderate-yellowish-brown, medium- to coarse-grained sandstone with locally well-developed limonite bands ("picture rock" or "landscape stone") to a moderate-brown, chert-pebble conglomerate; forms a dark-brown to moderate-yellowish-brown caprock above the Moenkopi Formation; along the northern edge of the quadrangle, conglomerate is overlain by a sandstone ledge; in some places, the two ledges are separated by up to a few feet of brownish-gray to grayish-purple bentonitic shale; variable in composition and thickness because it represents stream channel deposition; ranges from 5-200 feet (1.5-61 m) thick.

unconformity

TRmu **Upper red member of the Moenkopi Formation** -- Moderate-reddish-brown, thin-bedded siltstone and very fine-grained sandstone with some thin gypsum beds and abundant discordant gypsum stringers; ripplemarks common in the siltstone; forms a slope with a few minor sandstone ledges; locally includes 20-foot-thick, (6-m-) fine-grained, resistant sandstone near base; 450 feet (136 m) thick.

TRms **Shnabkaib Member of the Moenkopi Formation** -- Light-gray to pale-red, "bacon-stripe", gypsiferous siltstone with several thin interbeds of dolomitic, unfossiliferous limestone near the base; upper portion is very gypsiferous and weathers into a powdery soil; forms a valley except where held up by more resistant overlying units; 900 feet (272 m) thick.

TRmm **Middle red member of the Moenkopi Formation** -- Interbedded moderate-red to moderate-reddish-brown siltstone, mudstone, and thin-bedded, very fine-grained sandstone with thin interbeds and veinlets of greenish-gray to white gypsum; forms a slope; commonly covered with stream terrace gravels; 375 feet (114 m) thick.

TRmv **Virgin Limestone Member of the Moenkopi Formation** -- Five distinct medium-gray to yellowish-brown marine limestone ledges interbedded with nonresistant, moderate-yellowish-brown, muddy siltstone, pale-reddish-brown sandstone, and light-gray to grayish-orange-pink gypsum; limestone beds are 3-15 feet (1-5 m) thick and contain five-sided echinoderm and shell fragments; total thickness is 200 feet (61 m).

TRml **Lower red member of the Moenkopi Formation** -- Moderate-reddish-brown siltstone, mudstone, and fine-grained, slope-forming sandstone; generally calcareous with interbeds and stringers of gypsum; ripple marks and small-scale cross-beds are common in the siltstone; thickness varies considerably from 0-200 feet (0-61 m) because of deposition over paleotopography.

TRmt **Timpoweap Member of the Moenkopi Formation** -- Dark-yellowish-orange and moderate reddish-brown, thin- to very thin-bedded, calcareous siltstone with thin, medium-gray limestone beds and medium- to coarse-grained sandstone near the base; gypsiferous near the top with lenses of gypsum and sandstone; gypsum forms punky surface; poorly lithified and forms slope; varies from 0-100 feet (0-30 m) thick due to deposition over paleotopography.

TRmr **Rock Canyon Conglomerate Member of the Moenkopi Formation** -- Yellowish-gray to light-olive-gray, clast-supported, but grading upward to a matrix-supported conglomerate with pebble- and cobble-sized clasts; basal layers contain angular to sub-angular limestone ripup clasts and brecciated blocks from the Harrisburg Member, locally cemented with sparry calcite, rounding increases upward to sub-rounded, mostly chert clasts near top; grades upward to calcareous, gritty, poorly sorted, pebble conglomerate with coarse sandstone lenses; thick, locally lenticular bedding; indurated; cliff forming; filled paleocanyons eroded into the Kaibab Formation; thickness 0-200 feet (0-61 m).

unconformity

PERMIAN

Pkh **Harrisburg Member of the Kaibab Formation** -- Light-gray, fossiliferous, sandy, fine- to medium-grained limestone interbedded with red and gray gypsiferous siltstone, sandstone, and gray gypsum beds several feet thick; beds of cherty limestone and sandy limestone about 20 foot-thick (6 m) form resistant ledges near upper middle; solution of interbedded gypsum causes local distortions; forms slope with limestone ledges; thickness varies greatly due to subaerial erosion; 0-300 feet (0-91 m) thick.

Pkf **Fossil Mountain Member of the Kaibab Formation** -- Yellowish-gray, abundantly fossiliferous, cherty limestone that forms a prominent cliff; silicified fossils include corals, brachiopods, crinoids, and bryozoans; reddish-brown and black chert forms irregularly bedded nodules and causes the outcrop to appear black-banded; 100-300 feet (30-91 m) thick.

unconformity

Pt **Toroweap Formation** -- shown in cross section only

Ptw **Woods Ranch Member of the Topoweap Formation** -- Grayish-pink to very-pale-orange massive gypsum with interbeds of light-brownish-gray siltstone and pale-red shale; forms slope, commonly covered with talus; beds distorted from dissolution of gypsum; 200 feet (61 m) thick.

Ptb **Brady Canyon Member of the Toroweap Formation** -- Medium-light-gray to dark-gray, medium- to coarse-grained, thick-bedded, fossiliferous limestone with reddish-brown chert nodules; forms prominent cliff; 250 feet (76 m) thick.

Pts **Seligman Member of the Toroweap Formation** -- Consists of three sections: upper section of medium-gray, thin-bedded, sandy limestone; middle section of interbedded yellowish-gray, calcareous, very fine-grained sandstone and grayish-yellow, gypsiferous, calcareous siltstone; and basal section of pale-yellowish-brown, fine-grained sandstone; forms recess in cliff of Virgin River Gorge; 100 feet (31 m) thick.

unconformity

Pq **Queantoweap Sandstone** -- Pale-yellow to grayish-pink, calcareous, thickly-bedded, fine-grained sandstone; forms steep slope in Virgin River Gorge; only the upper 150 feet (45 m) is exposed in the quadrangle.

Subsurface Units

Pp **Pakoon Dolomite** -- shown in cross section only

PENNSYLVANIAN

IPc **Callville Limestone** -- shown in cross section only

MISSISSIPPIAN

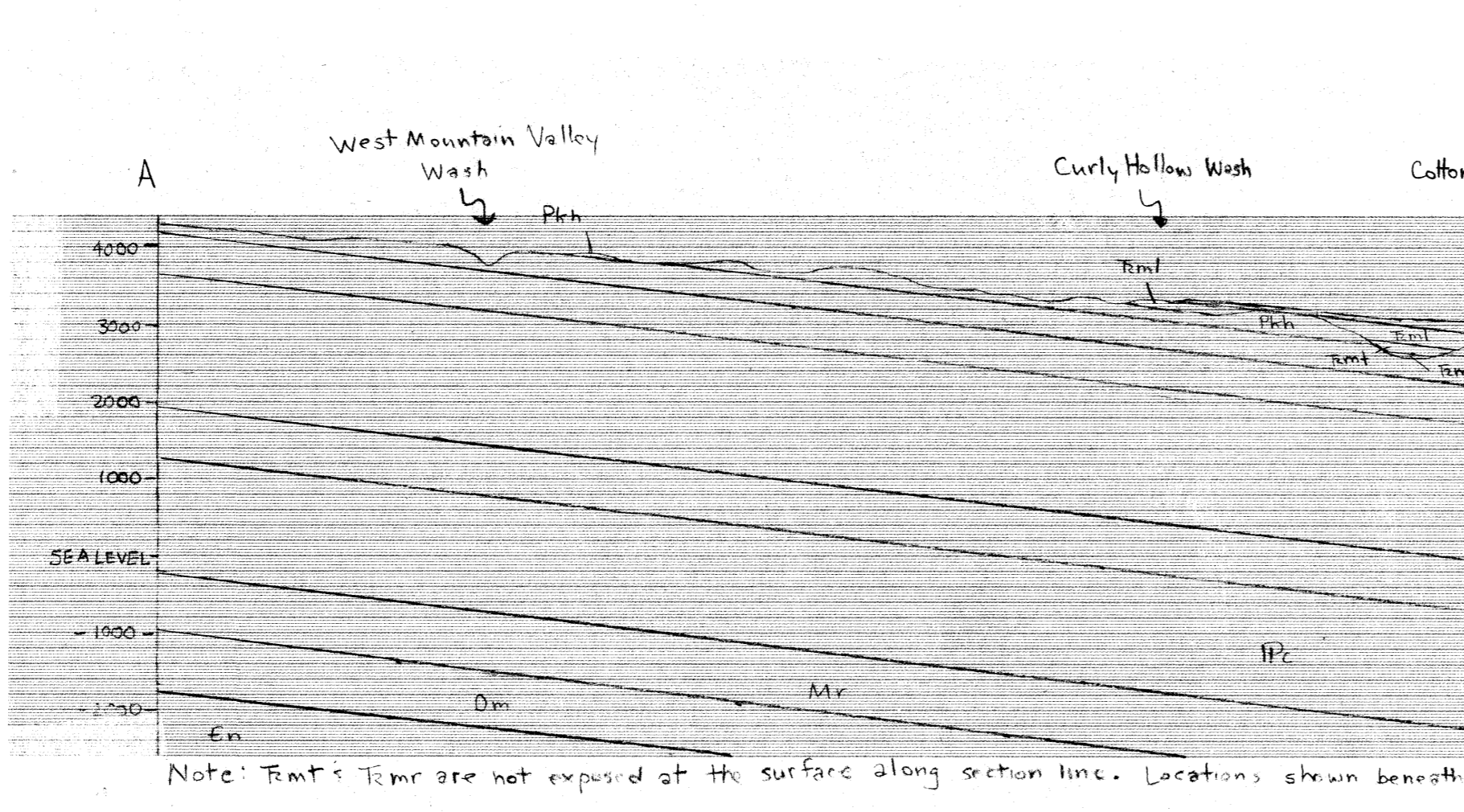
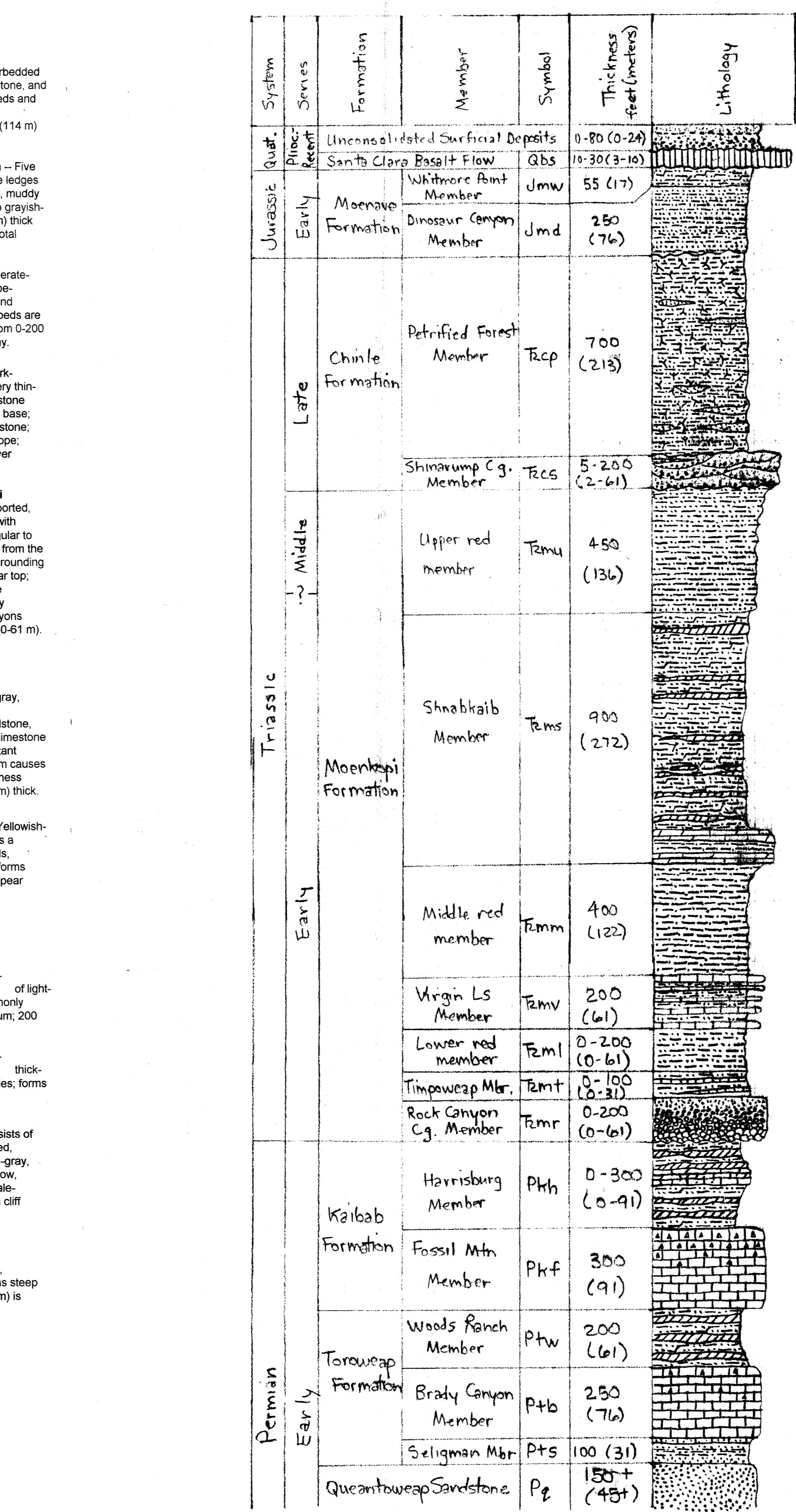
Mr **Redwall Limestone** -- shown in cross section only

DEVONIAN

Dm **Muddy Peak Dolomite** -- shown in cross section only

CAMBRIAN

Cn **Nopah Dolomite** -- shown in cross section only



Key to Map Symbols

Contact

High-angle fault -- dashed where approximately located, dotted where concealed, bar and ball on down-thrown side

Axial trace of syncline -- dotted where concealed

Strike and dip of inclined bedding

Gravel or road-fill pit

Quarry

Spring

Cave

ERA	SYSTEM	SERIES
MESOZOIC	JURASSIC	Lower
		Jmw
		Jmd
		unconformity
		TRcp
		unconformity
		TRcs
	TRIASSIC	Upper
		TRmu
		TRms
		unconformity
		Middle
		TRmm
		Lower
PALEOZOIC	PERMIAN	Lower
		TRmv
		TRml
		TRmt
		TRmr
		unconformity
		Pkh
	TRIASSIC	Upper
		Pkf
		unconformity
		Ptw
		Ptb
		Pts
		unconformity
		Pq

PLATE 2
WHITE HILLS QUADRANGLE
J. M. HIGGINS

CORRELATION OF BEDROCK UNITS

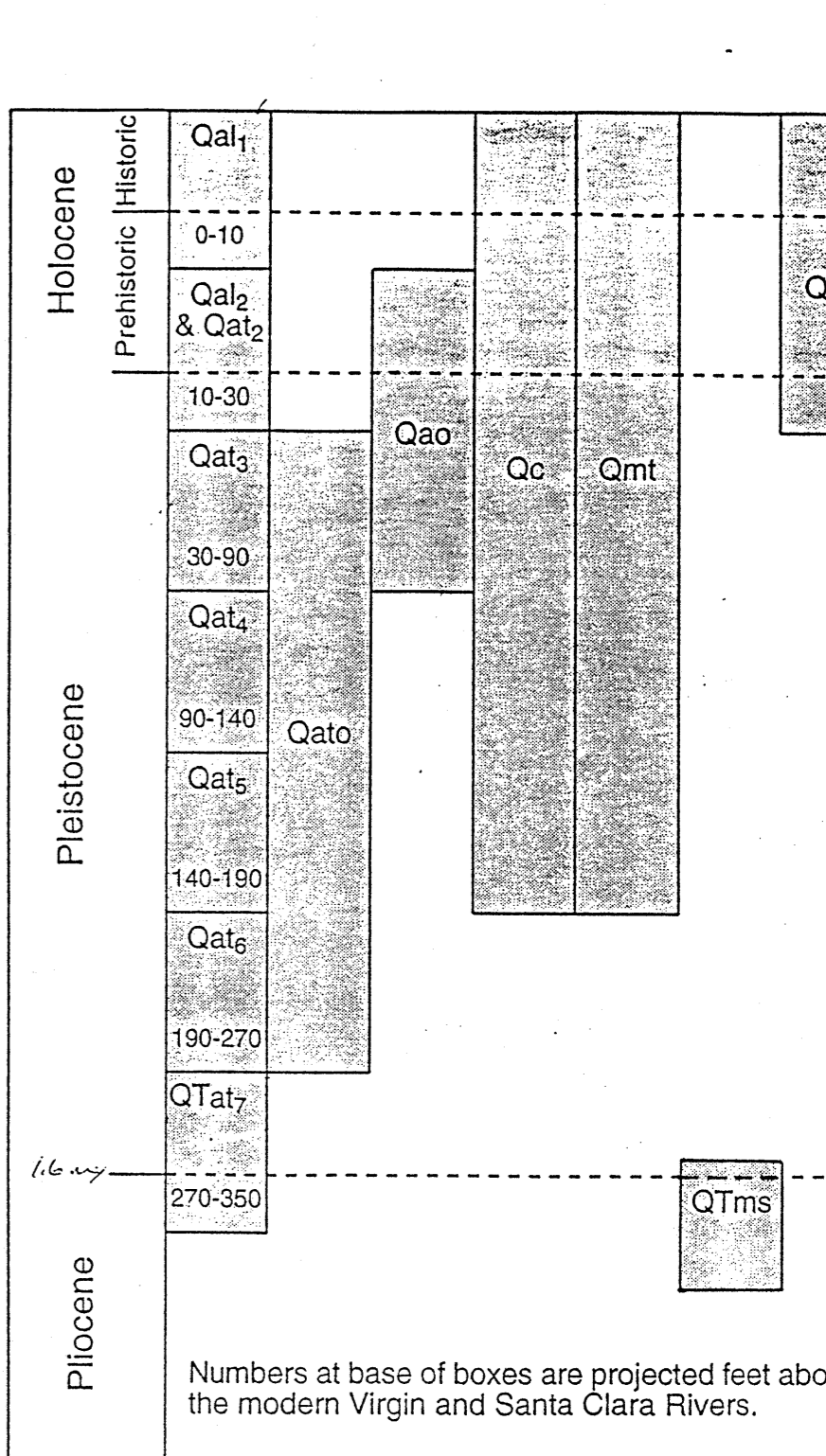
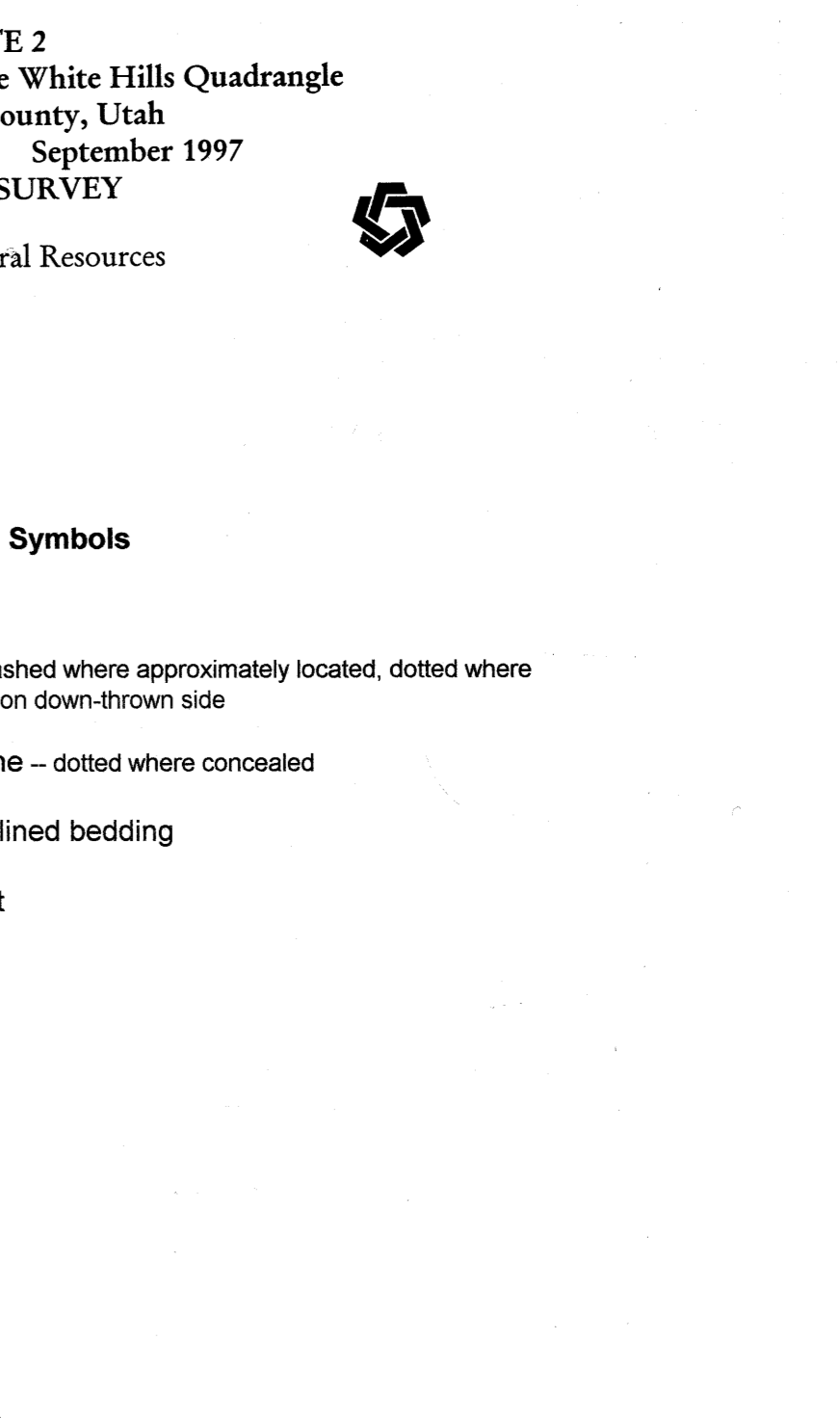


PLATE 2
WHITE HILLS QUADRANGLE
J. M. HIGGINS

CORRELATION OF SURFICIAL DEPOSITS